3 SEDIMENT SAMPLING AND ANALYSIS

This section addresses procedures for the collection of surface and subsurface sediments at the site.

3.1 Sediment Sampling Locations

As discussed in the OMMP, the objective of the sediment sampling activities described in this SAP is to investigate the long-term effectiveness of the sediment cap at Deposit 1 and to ensure that the cap material will be maintained as designed.

A total of two surface grab samples will be taken from two "low spot" areas identified from the bathymetric survey. In addition to the two surface (0 to 10 cm) sediment samples, three subsurface sediment samples will be collected from Stations SC-1, SC-2, and SC-3 (Figure 1) to delineate the vertical extent of PCB concentrations within the sediment cap. Subsurface core location coordinates are provided in Table 1.

3.2 Sampling Schedule

Sediments will be collected during one sampling event in Year 2 and in Year 4 following the completion of the remedial action as outlined in the CAP (Ecology 2005). Unscheduled sediment monitoring will be conducted following a 50-year or higher flood event and will be performed using the same procedures described in this SAP for a scheduled routine monitoring event. Should more than two 50-year flood events occur during the first five years of the cap life, Ecology will determine if additional long-term monitoring is required.

3.3 Site Access

Site access will be obtained by launching the sampling vessel at the boat launch adjacent to Upriver Dam. Permission for access to the boat launch will be coordinated with the dam operators.

3.4 Station Positioning and Location Control

Whenever possible, station positioning will be determined by differential global positioning system (DGPS). Measured station positions will be converted to latitude and longitude (North American Datum [NAD] 83) to the nearest 0.1 second. The accuracy of measured

and recorded horizontal coordinates will be within 1 meter. However, it is possible that electrical interference near the Upriver Dam may prevent use of DGPS. If this is the case, station positioning will be determined using a hand-held GPS unit and the data will be treated as described above. The DGPS instrumentation is normally accurate to 1 to 3 meters, while GPS instrumentation is normally accurate to 3 to 10 meters; however, for readings taken near large electrical equipment (such as Upriver Dam), accuracy may be somewhat degraded. Vertical elevation of each sediment sampling station will be measured using a fathometer or lead line and converted to North American Vertical Datum 88 (NAVD88) vertical datum using water level records maintained at Upriver Dam.

3.5 Field Documentation Procedures

Field procedures, sample information, and custody records will be maintained in a variety of log sheets and forms. Procedures used to document station locations, sample collection, and sample custody are described in this section.

3.5.1 Field Logs and Sample Labels

A field logbook and station and sample log forms will be used to document sample collection activities. A bound, waterproof notebook with consecutively numbered pages will be used for the field logbook. All daily field activities will be documented in indelible ink in this logbook; all entries will be signed and dated and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark that is signed and dated by the sampler. Field logbooks will be stored in a secure manner when not in use. The following information will be recorded in the field logbook each day of sample collection:

- Project name and location
- Project number
- Date and time of entry (24-hour clock)
- Time and duration of daily sampling activities
- Weather conditions
- Variations, if any, from specified sampling protocols and reasons for deviations
- Name of person making entries and other field personnel
- Onsite visitors, if any

- Specific information on each type of sampling activity (i.e., surface sediment or sediment core)
- Station name, date, gear, water depth, and location coordinates
- Sample identifiers and sample numbers for all samples collected each day

Each gear deployment event will be recorded on a station or sample log sheet. One or more station or sample log sheets will be completed for each station sampled. The station name, date, gear, cast number, depth, and location coordinates will be recorded on each log sheet.

A sample label will be completed for each sample and attached to the outside of each sample container. All sample label entries will be made with indelible ink. The sample labels will include the following information: sample number, site name, sampling date and time, sampling personnel, and preservative (if appropriate).

3.5.2 Sample Identifiers

A set of sample identifiers will be established before field sampling begins. Sample numbers will be assigned in the field as samples are being collected. The suite of sample identification codes is designed to fulfill three purposes: 1) to identify related samples (i.e., replicates), 2) to ensure proper data analysis and interpretation, and 3) to obscure the relationships between samples so that laboratory analysis will be unbiased by presumptive similarities between samples. The sample identifier codes and their uses are described below:

- Location Identifier – This will consist of the initials UPR followed by a location number (station number). The sample location number will be as identified in Table 1. For example, subsurface sediment sample collected at Station SC-1 will have a location identifier of UPR-SC-1XX, where XX is the matrix identifier as described below.
- Matrix Identifier – The matrix identifier will follow the location identifier. Matrix identifiers for this project are SD for sediment. For example, a sediment sample retrieved from Station UPR-SC-1 would have a sample identifier code of UPR-SC-1SD.

- Depth Identifier – The depth identifier for core samples is a dash followed by a consecutive letter that follows the SD identification (-A for the first interval, -B for the second, etc.). The first depth interval for a sediment core sample collected from UPR-SC-1SD would be identified as UPR-SC-1SD-A.
- Date Identifier – The date identifier is a dash followed by a date code (YYMMDD), where YY = year, MM = month, and DD = day of month.

3.6 Equipment Decontamination Procedures

Decontamination procedures to be used during sample collection are specified in this section. The objective for decontamination is to reduce the chance of cross-contaminating samples collected from one location to the next.

The van Veen grab sampler, piston head of the piston corer, and polycarbonate core tubes will be decontaminated prior to sampling at each location. Decontamination of this equipment will consist of scrubbing and rinsing the equipment down with site water, followed by a non-phosphatic detergent wash (consisting of a dilute mixture of Liquinox and tap water), and site water rinse. Care will be taken during sampling to avoid contact of the clean sampling equipment with potentially contaminated surfaces.

All sample processing equipment and reusable materials that contact the sediment will be decontaminated on site and between sampling locations. Decontamination will follow this sequence:

1. Tap water or site water (for sampling equipment) rinse
2. Nonphosphatic detergent wash (visible sediment to be removed by scrubbing in previous step)
3. Tap water rinse
4. Distilled-water rinse three consecutive times
5. Cover clean equipment with aluminum foil

3.7 Surface Sediment Sampling

Surface sediment sampling procedures and chemical analyses are described in the following section. The Quality Assurance Project Plan (QAPP; see Section 4) provides additional details regarding quality assurance/quality control (QA/QC) procedures.

3.7.1 Surface Sediment Sampling Procedures

Surface sediment samples (0 to 10 cm below mudline) will be collected using a stainless steel van Veen or similar grab sampler in accordance with standard methods described in EPA 1986 as updated in 1989, 1991, 1995, and 1997. Sample collection will be documented on the attached surface sediment collection record (Figure 2).

Upon retrieval, material collected in the grab sampler will be evaluated for acceptability according to the following criteria:

- The sampler is not overfilled.
- Overlying water is present.
- The overlying water is not excessively turbid.
- The sediment surface is relatively undisturbed (no winnowing).
- A sediment penetration depth of at least 12 cm is attained.

After a sediment grab is accepted, the overlying water will be siphoned off and the upper 10 cm of sediment will be collected in accordance with EPA (1986 as updated in 1989, 1991, 1995, and 1997) guidelines. Stainless steel spatulas and spoons will be used to transfer the sediment to a stainless steel bowl. A stainless steel ruler will be used to ensure that the sediment penetration depth of the sampler is adequate and that the correct sediment depth interval is removed. Sediment touching the sides of the grab sampler will not be collected.

Sediment in the bowl will then be mixed with a large stainless steel spoon until uniform texture and color are achieved. Subsamples of the homogenized sediment will be transferred to pre-cleaned glass containers with Teflon-lined lids and immediately placed on ice in a cooler.

3.7.2 Surface Sediment Sample Analysis

All surface sediment samples collected from the two stations to be determined from the forthcoming bathymetric survey will be analyzed for PCB Aroclors using EPA Method 8082, total organic carbon (TOC), total solids, and grain size. At least one sample from each location will be frozen at -20°C and archived for potential future analyses.

Method reporting limits are summarized in Table 2. Sample jars and preservation and holding time requirements are summarized in Table 3.

3.8 Subsurface Sediment Sampling

Subsurface sediment sampling procedures and chemical analyses are described in the following section. The accompanying QAPP (Section 4) provides additional details regarding QA/QC procedures.

3.8.1 Subsurface Sediment Sampling Procedures

Subsurface sediment samples will be collected using a piston coring device fitted with 2.87-inch inner diameter polycarbonate tubing. Should this method not prove successful, alternative methods such as diver assisted sampling may need to be employed.

Core collection will be documented on the attached Sediment Core Collection Form (Figure 3). Extra polycarbonate tubes will be available during sample operations for uninterrupted sampling in the event of a potential core tube breakage or contamination. Samples will be collected in the following manner:

- The core tube will be decontaminated.
- Water depth will be sounded with the piston cable.
- The core tube will be attached to the piston head.
- The coring device will be gradually lowered into the water.
- The piston cable will be tied off to the deck in order to secure the piston in the core tube at approximately 20 cm above the sediment-water interface.
- The core will be driven into the sediment, using drive rods, until refusal.
- The filled core tube will be retrieved slowly and steadily to avoid agitating the sample.
- As the corer is lifted out of the water, a plug will be immediately inserted into the bottom of the core tube to prevent sediment from slipping out.
- The core will be evaluated against the following acceptability criteria:
  - At least 5 cm of overlying water is present
  - The overlying water is not excessively turbid
  - The sediment surface is relatively undisturbed

  - At least 80 percent core recovery versus penetration is observed
- If the core meets the above acceptability criteria, the core will be processed immediately by cutting the core lengthwise into two equal halves or by extruding the sediment from the base of the core tube.
- The characteristics of the core will be documented (as described below) as the sediment is being extruded.
- Each core will be sectioned at three intervals to visually correspond to the base cap layer, coal layer, and sub cap layer.
- Sediment from the middle of each core interval will be thoroughly homogenized and transferred into an appropriate pre-labeled sample container (certified, pre-cleaned) and placed immediately on ice for transport to the appropriate laboratory. Care will be taken to not mix sediment intervals (i.e., coal layer with the base cap layer).

As samples are taken, logs and field notes of all core samples will be maintained and correlated to the sampling location map. The following information will be included in this log:

- Elevation of each boring station sampled; this will be accomplished using a fathometer or lead line
- Location of each boring station as determined by the on-board DGPS or GPS
- Date and time of collection of each sediment core sample
- Names of field supervisor and person(s) collecting and logging the sample
- Observations made during sample collection, including weather conditions, complications, boat traffic, and other details associated with the sampling effort
- The sample station number
- Length and depth intervals of each core section and recovery for each sediment sample
- Qualitative notation of apparent resistance of sediment column to coring
- Any deviation from the approved sampling plan

In addition, a sediment description of each core sample will be recorded on the core log for the following parameters as appropriate and present:

- Sample recovery (depth in feet of penetration and sample compaction)

- Physical soil description in accordance with the Unified Soil Classification System (includes soil type, density and consistency of soil, color)
- Odor (e.g., hydrogen sulfide, petroleum)
- Vegetation
- Debris
- Biological activity (e.g., detritus, shells, tubes, bioturbation, live or dead organisms)
- Presence and depth (feet) of the redox potential discontinuity layer
- Presence of oil sheen
- Any other distinguishing characteristics or features

3.8.2 Subsurface Sediment Sample Analysis

A maximum of three subsurface sediment sample intervals will be collected at Stations SC-1, SC-2, and SC-3 (Table 1) and analyzed for PCB Aroclors using EPA Method 8082, TOC, total solids, and grain size (for a total of a maximum of nine samples, excluding QA/QC). After analysis, all sediment core intervals from each location will be frozen at -20°C and archived.

Method reporting limits are summarized in Table 2. Sample jars and preservation/ holding time requirements are summarized in Table 3.

3.9 Sample Custody and Transport Procedures

All containerized sediment samples will be transported to the analytical laboratory after preparation is completed. Specific sample shipping procedures will be as follows:

- Each cooler or container containing the sediment samples for analysis will be shipped to the laboratory within 24 hours of being sealed.
- Individual sample containers will be placed in a sealable plastic bag, packed to prevent breakage, and transported in a sealed ice chest or other suitable container.
- The shipping containers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the container, and consultant's office name and address) to enable positive identification.
- Glass jars will be separated in the shipping container by shock absorbent material (e.g., bubble wrap) to prevent breakage.

- Ice will be placed in separate plastic bags and sealed
- A sealed envelope containing chain-of-custody forms will be enclosed in a plastic bag and taped to the inside lid of the cooler
- The cooler lids will be secured by wrapping the coolers in strapping tape
- Signed and dated chain-of-custody seals will be placed on all coolers prior to shipping

Upon transfer of sample possession to the analytical laboratory, the persons transferring custody of the sample container will sign the chain-of-custody form. Upon receipt of samples at the laboratory, the shipping container seal will be broken and the condition of the samples recorded by the recipient. Chain-of-custody forms will be used internally in the lab to track sample handling and final disposition.

3.10 Investigation-Derived Waste Handling Procedures

It is not anticipated that any investigation-derived waste will be generated during this sampling effort. No organic solvents will be used for decontamination during this investigation. All detergents used will be phosphate free and site water used for decontamination of sampling equipment will be returned directly to the site. Excess sediment collected during coring will be properly disposed of and not returned directly to the site. All other disposable materials (e.g., gloves) will be bagged and discarded in a municipal waste container.